

## Measurements and Instrumentation

### Two mark question Answer

#### Unit I Measurement of voltage and Current

##### 1. What is meant by measurement?

Measurement is an act or the result of comparison between the quantity and a predefined standard.

##### 2. Mention the basic requirements of measurement.

- The standard used for comparison purpose must be accurately defined and should be commonly accepted.
- The apparatus used and the method adopted must be provable.

##### 3. What are the 2 methods for measurement?

- Direct method and
- Indirect method.

##### 4. Explain the function of measurement system.

The measurement system consists of a transducing element which converts the quantity to be measured in an analogous form. the analogous signal is then processed by some intermediate means and is then fed to the end device which presents the results of the measurement.

##### 5. Define Instrument.

Instrument is defined as a device for determining the value or magnitude of a quantity or variable.

##### 6. List the types of instruments.

- The 3 types of instruments are
- Mechanical Instruments
- Electrical Instruments and
- Electronic Instruments.

##### 7. Classify instruments based on their functions.

Indicating instruments

Integrating instruments

Recording instruments

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##### 8. Give the applications of measurement systems.

- The instruments and measurement systems are used for
- Monitoring of processes and operations.
- Control of processes and operations.
- Experimental engineering analysis.

##### 9. Why calibration of instrument is important?

The calibration of all instruments is important since it affords the opportunity to check the instrument against a known standard and subsequently to errors in accuracy.

##### 10. Explain the calibration procedure.

Calibration procedure involves a comparison of the particular instrument with either.

- A primary standard
- A secondary standard with a higher accuracy than the instrument to be calibrated or An instrument of known accuracy.

**11. Define Calibration.**

It is the process by which comparing the instrument with a standard to correct the accuracy.

**12. Name the different essential torques in indicating instruments.**

Deflecting torque

Controlling torque

Damping torque

**13. Name the types of instruments used for making voltmeter and ammeter.**

PMMC type

Moving iron type

Dynamometer type

Hot wire type

Electrostatic type

Induction type.

**14. State the advantages of PMMC instruments**

Uniform scale.

No hysteresis loss

Very accurate

High efficiency.

**15. State the disadvantages of PMMC instruments**

Cannot be used for ac m/s

Some errors are caused by temperature variations.

**16. State the applications of PMMC instruments**

m/s of dc voltage and current

used in dc galvanometer.

**17. How the range of instrument can be extended in PMMC instruments.**

In ammeter by connecting a shunt resistor

In voltmeter by connecting a series resistor.

**18. State the advantages of Dynamometer type instruments**

Can be used for both dc and ac m/s.

Free from hysteresis and eddy current errors.

**19. State the advantages of Moving iron type instruments**

Less expensive

Can be used for both dc and ac

Reasonably accurate.

**20. State the advantages of Hot wire type instruments**

Can be used for both dc and ac

Unaffected by stray magnetic fields

Readings are independent of frequency and waveform.

**Unit II Measurement of Power and Energy**

**1. What are the constructional parts of dynamometer type wattmeter?**

Fixed coil

Moving Coil

Current limiting resistor

Helical spring

Spindle attached with pointer

Graduated scale

**2. Write down the deflecting torque equation in dynamometer type wattmeter.**

$T_d \propto VI \cos \phi$

**3. State the disadvantages of Dynamometer type wattmeter.**

Readings may be affected by stray magnetic fields.

At low power factor it causes error.

**4. Name the errors caused in Dynamometer type wattmeter.**

Error due to pressure coil inductance

Error due to pressure coil capacitance

Error due to methods of connection

Error due to stray magnetic fields

Error due to eddy current.

**5. How the errors caused by pc inductance is compensated.**

By connecting a capacitor in parallel to the resistor.

**6. How the errors caused by methods of connection is compensated**

By using compensating coil.

**7. Name the methods used for power measurement in three phase circuits.**

(i) single wattmeter method

(ii) wattmeter method

(iii) wattmeter method.

**8. What are the special features to be incorporated for LPF wattmeter?**

Pressure coil circuit

Compensation for Pressure coil current

Compensation for Pressure coil inductance.

**9. Define Phantom loading.**

Method by which energizing the pressure coil circuit and current coil circuits separately is called phantom loading.

**10. State the use of phantom loading.**

Power loss is minimized.

**11. Name the methods used in Wattmeter calibration.**

By comparing with std wattmeter.

By using voltmeter ammeter method.

By using Potentiometer.

**12. What are the types of energy meters?**

Electrolytic meters

Motor meters.

Clock meters

**13. Name the constructional parts of induction type energy meter.**

Current coil with series magnet

Voltage coil with shunt magnet

Al disc

Braking magnet

Registering mechanism.

**14. How voltage coil is connected in induction type energy meter.**

It is connected in parallel to supply and load.

**15. How current coil is connected in induction type energy meter.**

It is connected in series to the load.

**16. Why Al disc is used in induction type energy meter.**

Aluminum is a nonmagnetic metal.

**17. What is the purpose of registering mechanism.**

It gives a valuable number proportional to the rotations.

**18. What is the purpose of braking mechanism.**

It provides necessary braking torque.

**19. Define creeping.**

Slow but continuous rotation of disc when pc is energized and cc is not energized.

**20. State the reason why holes are provided in Al disc.**

To avoid creeping holes are provided on both sides of Al disc.

**Unit III Potentiometer and Instrument Transformers**

**1. What is the basic principle used in potentiometer.**

In potentiometer the unknown emf is measured by comparing it with a std known emf.

**2. Name the potentiometer material used.**

German silver

Manganin wire

**3. Define standardization.**

It is the process by which adjusting the current flows through the potentiometer coil to make the voltage across the std cell is equal.

**4. State the applications of potentiometer.**

Used for m/s of unknown emf

Used for ammeter calibration

Used for Voltmeter calibration

Used for wattmeter calibration

**5. State the advantages of crompton potentiometer.**

More accurate

Easy to adjust

**6. What are the practical difficulties in ac potentiometers.**

More complicated

Accuracy is seriously affected

Difficulty is experienced in standardization.

**7. Classify ac potentiometers.**

Polar potentiometer

Coordinate potentiometer.

**8. How the phase angle is measured in polar type potentiometers.**

It is measured from the position of phase shifter.

**9. Name some ac potentiometers.**

Drysdale Tinsley potentiometer

Gall Tinsley potentiometer

**10. State the advantages of ac potentiometers.**

Can be used for m/s of both magnitude and phase angle

Can be used for m/s of inductance of the coil.

It is used in m/s of errors in CTS

**11. State the applications of ac potentiometers.**

M/s of self inductance.

Ammeter calibration

Voltmeter calibration

Wattmeter calibration.

**12. State the advantages of instrument transformers.**

Used for extension of range

Power loss is minimum

High voltage and currents can be measured.

**13. State the disadvantage of instrument transformers.**

Cannot be used for dc measurements.

**14. What are the constructional parts of current transformer?**

Primary winding

Secondary winding

Magnetic core.

**15. Name the errors caused in current transformer.**

Ratio error

Phase angle error

**16. Define ratio error.**

The ratio of energy component current and secondary current is known as the ratio error.

**17. How the phase angle error is created.**

It is mainly due to magnetizing component of excitation current.

**18. State the use of potential transformer.**

Used for m/s of high voltage

Used for energizing relays and protective circuits.

**19. Name the errors caused in potential transformer.**

Ratio error

Phase angle error.

**20. How the CT and PT are connected in the circuits.**

CT is connected in series and PT is connected in parallel.

## **Unit IV Resistance Measurement**

**1. Classify resistance.**

Low resistance

Medium resistance

High resistance

**2. What is the range of medium resistance?**

Resistance of about 1 ohm to 100 kilo ohms are called medium resistance.

**3. Name the methods used for low resistance measurement.**

Ammeter – voltmeter method

Potentiometer method

Kelvin double bridge method

Ohm meter method.

**4. Name the methods used for medium resistance measurement**

Ammeter – voltmeter method

Substitution method

Wheatstone bridge method

Carey foster bridge method.

**5. Where high resistance m/s is required?**

Insulation resistance of cables

High resistance circuit elements

Volume resistivity of a material

Surface resistivity.

**6. State the advantages of Wheatstone bridge method.**

Free from errors

The balance is quite independent of source emf

**7. State the advantages of Kelvin double bridge method.**

Errors owing to contact resistance, resistance of leads can be eliminated by using this Kelvin double bridge.

**8. What are the constructional features of doctor ohmmeter?**

Permanent magnet

Current coil

Pressure coil

Battery

Pointer with graduated scale.

**9. Define megger.**

The megger is an instrument used for the measurement of high resistance and insulation resistance.

**10. Name the parts of megger.**

It consists of a hand driven dc generator and a direct reading true ohm meter.

**11. What is the range of low resistance?**

Resistance of about 1 ohm and under are included in this class.

**12. What is the range of medium resistance?**

Resistance of 100 kilo ohms and above are usually termed as high resistance.

**13. What ranges of resistance can be measured by using doctor ohmmeter.**

0 to 500 micro ohms

0 to 5 milli ohms

0 to 50 milli ohms

0 to 500 milli ohms

0 to 5 ohms.

**14. How resistance is measured in direct deflection method.**

The deflection of galvanometer connected in series with the resistance to be measured gives a measure of the insulation resistance.

**15. Classify the cables according to their sheathing.**

Armoured cables

Unarmoured cables.

**16. Name the leads present in megger.**

Earth lead

Line lead

Guard lead.

**17. How resistance is measured by using ohm meter method.**

Series ohm meter method

Shunt ohm meter method.

**18. How resistance is measured in loss of charge method.**

In this method a capacitor is charged and discharged for a specific time period and from this resistance is measured.

**19. State the balance equation used in bridge methods.**

The product of opposite branch resistances are equal.

**20. State the advantages of price's guard wire method.**

In this method leakage current does not flows through the meter and therefore it gives accurate reading.

**21. How the earth resistance is measured.**

By using earth megger the value of surface earth resistance can be measured.

**Unit V Impedance Measurement**

**1. State the use of ac bridges.**

AC bridges are used for the m/s of self and mutual inductance and capacitance.

**2. State the balance equation used in ac bridges.**

The product of opposite branch impedances are equal.

**3. Name the bridge circuits used for the m/s of self inductance.**

Maxwell's bridge

Maxwell-Wein Bridge

Anderson bridge

Hay's bridge.

**4. Name the bridge circuits used for the m/s of capacitance.**

De Sauty's bridge

Schering Bridge

Wein bridge

**5. Name the bridge circuits used for the m/s of mutual inductance.**

The Heaviside Campbell bridge

The Campbell bridge.

**6. Which type of detector is used in ac bridges?**

Vibration galvanometers are used.

**7. Name the ac sources used in ac bridges.**

AC supply with step-down transformer

Motor driven alternator

Audio frequency and radio frequency oscillator.

**8. In which cases audio frequency oscillators are used as ac source.**

For high frequency ac requirement audio frequency oscillators are used.

**9. Name the sources of errors in ac bridge m/s.**

Errors due to stray magnetic fields

Leakage errors

Eddy current errors

Residual errors

Frequency and waveform errors.

**10. State the advantages of Maxwell-wein bridge.**

The balance equation is independent of frequency and therefore more accurate.

**11. State the disadvantage of Maxwell-wein bridge.**

This method needs a std variable capacitor. Variable Capacitor is costliest.

**12. State the disadvantages of Hay's bridge.**

The balance equation is dependent of frequency and therefore any changes in frequency will affect the m/s.

**13. State the use of Wein bridge.**

It is used for the m/s of unknown capacitance and frequency.

**14. What is the use of Campbell bridge?**

This is used for the m/s of mutual inductance.

**15. What is meant by inductometer?**

The std variable mutual inductance meter is called as inductometer.

**16. Define Q-factor of the coil.**

It is the ratio between power stored in the coil to the power dissipated in the coil.

**17. Name the components of iron loss.**

Eddy current loss

Hysteresis loss.

**18. Name the faults that occurs in cables.**

Break down of cable insulation

Short circuit fault

Open conductor fault.

**19. Name the loop test methods used in location of fault.**

Murray loop test

Varley loop test.

**20. How leakage errors are minimized in ac bridge circuits.**

By using high grade insulation.